Professor Vladimir Rovenski at his 65-th Anniversary

http://math.haifa.ac.il/ROVENSKI/rovenski.html

Vladimir Rovenski was born on the 12th of May, 1953 and grew up in the city of Karaganda, in Kazakhstan (USSR). He attended there the Physics-Mathematical school (graduation with gold medal) and the Correspondence Mathematical School in Moscow State University (2 years); he was a prize winner of regional, all-Siberian and all-USSR olympiads in Mathematics and Physics.

After finishing the secondary school (and at the same period, the Music school - the piano section), Professor Rovenski entered the Mathematical Faculty of the Novosibirsk State University as a student and graduated from it in 1976 with honors diploma in Mathematics and Applied Mathematics, with the title of his Thesis: "Quasi-affine functions and programming". He received his PhD in Mathematics and Physics from the Sobolev Institute of Mathematics at Novosibirsk of the Siberian Branch of the USSR Academy of Sciences in 1985, on the topic "Multi-dimensional uniquely projecting surfaces in a sphere and projective spaces". In 1994, at this institute, Rovenski defended his Doctoral thesis "Geometry and topology of foliations with nonnegative curvature in mixed directions" and was awarded a DSc in Mathematics and Physics from the Russian Academy of Sciences. In 1996, Dr. Rovenski became a full professor of the geometry department at the Krasnoyarsk Pedagogical University, by the decision of Russian Higher State Educational Committee.

Professor Rovenski's scientific interests were influenced by his advisor, the well-known Riemannian geometer Prof. V.A.Toponogov (1930–2004). The first years his scientific life were devoted to the study of the fundamental Toponogov's problem, which asserts that, a codimension n totally geodesic foliation of a closed manifold with positive mixed sectional curvature, has a small dimension k, that is $k < \rho(n)$, where $\rho(n)$ is the number of linear independent vector fields on an $(n-1)$-sphere. Here, the mixed curvature is encoded in the Riccati and Jacobi equations, and regulates the deviation of leaves along the leaf geodesics; in the language of mechanics it measures the rate of relative acceleration of two particles moving forward on neighboring geodesics. Professor Rovenski's study of this problem was supported in 1994–1995 by a Grant from the Russian Fund of Fundamental Investigations (RFFI), with the project title: "Geometry and topology of foliations with nonnegative curvature in mixed directions". He developed a methodology for finding solutions in a local sense for the Toponogov problem: he found an example, which means necessity of more conditions when the foliation is given in a neighborhood of a complete leaf, solved the problem for the case of ruled submanifolds in an

n-sphere, and proved certain rigidity and splitting theorems for foliations with nonnegative mixed sectional curvature, generalizing thus the results previously obtained by A.A.Borisenko and D.Ferus. His results were published in high level journals, (e.g., the survey [10] and the book [1R]).

Professor Vladimir Rovenski, jointly with Toponogov, generalized Berge's rigidity theorem (Appendix A in [1R]) and translated the textbook [4R].

In September 1998, Professor Rovenski moved to Haifa, Israel, and since 1999, he has been a senior scientist in the faculty of Aerospace Engineering at Technion – Israel Institute of Technology. There, jointly with his colleagues, he performed scientific research in the field of anisotropic elasticity and piezoelectricity and published several papers, scientific reports and a book (see [3R, 8R]). He teaches the course "Geometry with Maple" at University of Haifa, based on his textbooks [2R, 7R]).

From 2004 until present, Professor Rovenski has been a senior scientist and a lecturer in the Department of Mathematics at the University of Haifa. His fields of research are Differential Geometry of foliated structures and Mathematical modeling in Fluid Mechanics. He was a visiting professor of CRM, Barcelona within the program "Foliations" (2010), and of the Institute of Mathematics of Jagiellonian University, Krakow (2011).

During 2008–2010, Professor Rovenski was awarded with the Grant P-IEFF of Marie-Curie action, entitled: "Integral formulae and extrinsic geometry of foliations". He became a visiting professor at the University of Lodz, and jointly with Prof. Walczak, he made scientific investigations and published the book [10R]. His works of this period were focused on the fact that integral formulas for foliations provide general obstructions or existence of distributions and foliations (or compact leaves within them) with given geometric properties and to the problem of prescribing quantities of extrinsic geometry, see [8, 9, 20, 21, 22]. During 2011–2014, Professor Rovenski was awarded by the Grant P-ERG of Marie-Curie action, entitled: "Extrinsic geometric flows on foliated manifolds". Such a flow is provided by the evolution of a metric on a foliation under a differential equation, depending on the 2nd fundamental tensor of the leaves (see [7, 19]). The partial Ricci flow for foliations [13] was introduced to study the question: Which foliations admit metrics of positive constant mixed curvature? (related to Toponogov's problem).

Professor Rovenski, with more 40 years of experience in Riemannian geometry, has published more than 100 papers and 9 books, and organized International geometrical conferences (2008, 2013 with Proceedings [11R] and 2018) at University of Haifa. His main research interests are: differential geometry and topology of submanifolds [1, 2, 3, 4, 14, 15, 16, 17, 18] and foliations. Many of his works concern the problems regarding the mixed scalar curvature $\mathrm{S}_{\mathrm{mix}}$ of a foliation (i.e., an averaged sectional curvature over all the planes which non-trivially intersect all the distributions which are either tangent or normal

to the leaves), having strong relations with extrinsic geometry. The problem of prescribing leafwise constant $\mathrm{S}_{\mathrm{mix}}$ by a conformal change of the structure in directions which are tangent/normal to the leaves, motivated by the partial Ricci flow, was studied in [25] – [28]. The mixed Einstein-Hilbert action introduced in [5, 6, 12] as analog of the Einstein-Hilbert action, with the scalar curvature was hereby replaced by $\mathrm{S}_{\mathrm{mix}}$. It was shown that the Euler-Lagrange equations for the total $\mathrm{S}_{\mathrm{mix}}$ involve a new kind of Ricci curvature and these are presented in the form of an Einstein field equation (see [23, 24, 29]). Professor Rovenski continues his research in the field "Extrinsic Geometry of Foliations" (see the joint with P. Walczak prohect on the ResearchGate webpage). Professor Rovenski's expertise also includes mathematical methods in mechanics and modeling using Maple and Matlab programs: jointly with I. Gaissinski, he developed mathematical models for fluid mechanics, the results published in journals and books [5R, 6R, 9R, 12R].

Professor Vladimir Rovenski is one of the main mathematicians which, with kindness and professionalism, supported the activity of the international scientific society Balkan Society of Geometers. This year, at his 65-th birthday, we wish him a long, prolific and rewarding life.

The Balkan Society of Geometers representatives.

Brief references: books and chapters in books

[1R] *Foliations on Riemannian manifolds and submanifolds*. Birkhäuser, 1998, 286 pp.

[2R] *Geometry of curves and surfaces with MAPLE*. Birkhäuser, Boston, 2000, 310 pp.

[3R] *Analytical methods in anisotropic elasticity: with symbolic computational tools*. Birkhäuser, Boston, 2005, 451 pp. (with O. Rand).

[4R] Editorial Assistance and Translation from Russian of the V. Toponogov book "*Differential geometry of curves and surfaces: A concise guide*". Birkhäuzer, 2005.

[5R] *Non-linear models and computational methods*. University of Haifa, 2006, 845 pp. (with I. Gaissinski).

[6R] *Hydrodynamic instability analysis: perturbation methods*. Verlag Dr. Müller, 2009, 220 pp. (with I. Gaissinski and O. Kelis).

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[9R] *Non-linear models in mechanics: mathematical methods and applications*. Lambert Academic Publisher, Germany, 2010, 664 pp. (with I. Gaissinski).

[10R] *Topics in extrinsic geometry of codimension-one foliations*. Springer Briefs in Mathematics, Springer-Verlag, 2011, 114 pp. (with P. Walczak).

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